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ABSTRACT

Fermilab is a U.S. Department of Energy national laboratory for research exploring the fundamental nature of matter and energy. This paper describes the Fermilab LInC (Leadership Institute Integrating Internet, Instruction and Curriculum) Online program and the strategies used over the past six years to develop leadership teams that can: (1) recognize, design, and implement engaged learning experiences for and with their students based on local, state, or national standards; (2) effectively integrate technology in these experiences to allow students to communicate, collaborate, explore, research, and publish in ways that would not be feasible without the technology; and (3) provide professional development and act as change agents in their region. LInC has developed and refined a wide variety of scaffolding strategies to assist K-12 educators in making the transition from traditional lecture-based teaching to technology-supported engaged learning. LInC has also created a successful online course by developing online strategies to maintain and improve upon essential qualities of the original face-to-face course. Contains 7 references. (Author/MES)

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Strategies Used in *Fermilab LInC Online* to Develop Leadership Teams that Integrate Technology to Support Constructivist Learning

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Abstract: This paper describes the Fermilab LInC Online program and the strategies used over the past six years to develop leadership teams who can:

- recognize, design and implement engaged learning experiences for and with their students based on local, state or national standards.
- effectively integrate technology in these experiences to allow students to communicate, collaborate, explore, research and publish in ways that would not be feasible without the technology.
- provide professional development and act as change agents in their region.

LInC has developed and refined a wide variety of scaffolding strategies to assist educators in making the transition from traditional lecture-based teaching to technology-supported engaged learning. LInC has also created a successful online course by developing online strategies to maintain and improve upon essential qualities of the original face-to-face course.

Introduction

Fermilab LInC (http://www-ed.fnal.gov/lincon/) is an intensive full-online, partial-online or face-to-face professional development program for K-12 educators who are already connected to the Internet and want ideas and support for integrating it effectively into their existing curriculum. Our goal is to create a national cadre of educational leaders from urban, rural, and suburban districts who effectively use technology to support engaged/constructivist learning.

LInC (Leadership Institute Integrating Internet, Instruction and Curriculum) was developed in 1994 in response to a needs assessment with area school districts. Among the needs identified were:

- assistance in the transition to a new teaching/learning paradigm.
- staff development for computer and networking skills.
- development of in-district capabilities and leadership in effectively integrating emerging technologies as a means of improving instruction and curricula.

Research such as (Means et al. 1993, Jones & Valdez & Nowakowski & Rasmussen 1995, U.S. Congress, Office of Technology Assessment 1995) identified similar challenges and needs. Current research also calls for increased technology-related staff development, particularly in the area of integrating technology effectively into the curriculum (Trotter 1999, CEO Forum on Education & Technology 1999).

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In addition, the needs assessment attendees requested online resources and distance learning opportunities. Fermilab LInC is a non-profit grant-funded program that addresses these needs and was created by teachers for teachers. The LInC goals and design were developed in collaboration with a team of master teachers. To date, 30 educators from 12 school districts have participated as course facilitators or on the program design team. In all, about 200 educators from 60 school districts in 18 states have participated in the LInC program. The participants have included classroom teachers (from all K-12 grade levels and a wide range of subjects), staff developers, curriculum coordinators, library media specialists, counselors, technology coordinators and administrators.

LInC was originally offered in a face-to-face format and was expanded into an online format starting in the fall of 1997. Offering the course in an online format has enabled us to serve a more diverse group of educators. In the past two years of online courses, 74% of LInC participants have come from urban or rural districts. Some of our participants have stated that this type of expertise and staff development is not available to them locally. Participants have also reported that they greatly enjoyed working with a more diverse group of educators than they typically encounter in their own districts. The online strategies we have used have helped us to achieve an 85% retention rate in our online classes.

The strategies described in this paper have been developed and adjusted over a six-year period based on participant surveys, proposal and project assessments, instructor reflections during and after each course and input from an external evaluator. These strategies are not intended for use as a fixed recipe for staff development. Instead, consider them as tools to be selected, adjusted, mixed and matched according to your audience's needs.

Fermilab LInC Online Program Overview

The LInC program challenges participants to combine engaged/constructivist learning with effective use of technology to develop powerful learning projects for and with their students. The projects are Web-based and address local, state or national standards. In addition, the participants, as school/district leadership teams, create a staff development plan for their school or district.

The program includes the following components:

- an 80-hour course that can be taught face-to-face, partially online or completely online
- extensive Web-based instructional materials for participants (Mengel & Bingham & Ciesemier & Clifford & Gatz & LaMaster & Marszalek & Meehan & Quigg & White 2000a)
- follow-up support as participants implement projects and offer staff development
- a facilitators' academy for teams that wish to offer LInC or a similar course
- extensive Web-based materials for facilitators (Mengel & Gatz & LaMaster & Marszalek & Meehan & White 2000b) and support from mentors as teams conduct their first courses

The LInC course is usually taught as a one-semester (14-week) course for 4.5 graduate credits. The facilitators' academy is taught as a three-day face-to-face session for 1.5 graduate credits.

During evaluation by an external evaluator, LInC participants reported:

- engaged learning instruction positively affected teachers' classroom practices.
- greatly increased technical knowledge and skills.
- providing technical assistance to teachers and others.

After participating in LInC, many participants were involved in leadership behaviors such as:

- conducting inservices and workshops.
- writing grants.
- participating on a technology committee.
- participating in efforts to improve teaching and learning in their school or district.

Evaluation of the online course concluded that classroom projects were of similar quality to those produced in the face-to-face course.

Engaged Learning and Technology Integration Strategies

Scaffolding Engaged Learning and Technology Integration

The LInC program has used and refined a collection of scaffolding strategies to choose from to foster engaged learning and effective use of technology. Instructional materials for all of these strategies are available from the engaged learning section of the LInC Web site. Strategies include having participants:

- take part in a short simulation in order to experience a technology-supported engaged learning activity from a student's perspective.
- share their own best learning experiences and construct a list of indicators of engaged learning and effective technology use by identifying common attributes of their best experiences.
- read *Plugging In* (Jones & Valdez & Nowakowski & Rasmussen 1995) and compare its list of indicators with the list they created.
- discuss model and non-model project examples to identify the presence or absence of indicators of engaged learning and best use of technology.
- observe a live modeled group discussion that demonstrates the typical process involved in creating and revising a project proposal.
- read an example short series of e-mails between a project team and a facilitator that demonstrates the typical feedback and revision process for a proposal and later project work.

In addition to the above, we have developed a four-part activity to practice changing traditional curriculum which does not use technology to technology-supported engaged learning. In the first part, participants view strong and weak examples of proposal elements and then identify whether additional examples are strong or weak. In the second part, participants view and discuss "before" examples of whole proposals, a facilitator's analysis of the proposals (including guiding questions posed to the author about areas that can be improved) and improved "after" proposals. In the third part, participants view "before" and "after" examples of proposals and write facilitator's analyses. In the final part, participants view "before" examples and write facilitators' analyses and design improved "after" examples.

We recommend that participants do several of the above activities *before* they create a project proposal because it is easier to objectively analyze and learn from project ideas that are not their own or their colleague's. The next step is to have participants collaboratively create and revise their own project proposal for a unit within their existing curriculum. The proposal is short (about one page) and identifies key project elements such as learner outcomes (based on local, state or national standards), authentic task, hook, student direction and effective use of technology. We recommend having participants refine a project proposal *before* they start investing many hours in creating Web pages for their projects. Typically, we ask participants to brainstorm several possible project topics, narrow it down to two project proposals, and then discuss and choose the most promising one to proceed with.

In addition to the proposal, LInC participants write a scenario which describes their vision of how their project will play out in their classroom. The scenario is a narrative version of what someone might see and hear if they were visiting the classroom as the project is implemented. This helps participants reflect on and plan their project and get a clearer picture of what implementing the project will be like. This can help participants anticipate problems and decide how to work through them. The scenario is also an invaluable tool for facilitators to use to determine if participants understand and are applying engaged learning and best use of technology in their project. This allows facilitators to pose targeted questions to guide participants in recognizing and incorporating missing elements.

To complete their project, participants design Web pages for students to use to work through the project. Web pages for students invite students to start on the project by offering an authentic task or situation that piques their curiosity. The Web pages for students must provide enough information and resources so that students can form their own questions, make choices about how to proceed, explore alternatives at their own pace, collaborate with others and produce original work. Participants also create a rubric or a framework for a rubric that students contribute to in order to assess student work.

Modeling Engaged Learning and Technology Integration

The LInC course and facilitators' academy are designed to model the new teaching/learning paradigm and effective use of technology that we want educators to implement in their classrooms. This is important in order to have participants experience this style of learning first-hand, which improves their likelihood of incorporating it. This is modeled in many ways throughout the course. In particular:

- We respond to individual learning needs of participants, facilitating their movement along the continuum from more traditional to more contemporary teaching strategies. We ask participants to let us know their preferences and problems during the course and then adjust the course as needed to address their feedback.
- For the course, LInC participants have the authentic task of creating a curriculum unit on the Web for use with their own students that incorporates engaged learning and effective use of technology. For the facilitators' academy, participants have the authentic task of creating materials needed to offer a LInC course or similar staff development in their area.
- After initial discussions about engaged learning and effective use of technology, the majority of the course consists of participant-requested breakout groups which discuss the topics participants need to make progress on their projects or staff development plans. This encourages participants to direct their own learning.
- Course facilitators assist as coaches and guides as participants design and publish their work.
- Participants work collaboratively by frequently sharing their work, experiences and skills with their colleagues and by giving each other feedback. Participant discussion groups are formed and varied as needed during the course to give participants access to a variety of different perspectives. Most participants choose to work together on a project with their LInC team.
- Participants are encouraged to take on an instructor role by assisting other participants or by starting a discussion on an area of expertise. Past experience is valued and built upon.
- Participants are asked regularly to question and reflect upon their teaching, course concepts and how they might apply these concepts.
- Participants learn technical skills by using technology *as needed* to create their projects and staff development plans. Technical skills are not taught as an end in themselves. Technology is used to communicate and collaborate with experts and peers, to research new and frequently changing information and to publish original work to a worldwide audience.
- Course assessment is performance-based (based on project components), generative (participants construct knowledge and develop a useful product) and ongoing.

Online Learning Strategies

Effective online instruction shares many of the same characteristics as effective face-to-face instruction. Some of these characteristics may seem like they happen automatically in a face-to-face class. These don't have to be lost just because the course is online. They just have to be planned in more deliberately and adapted for use in the online medium. In fact, the need for some of these characteristics actually becomes magnified in an online course. This includes essential features such as making sure students are prepared for and know what to expect from the course, facilitating meaningful and frequent interaction for participants, coordinating staff for effective team-teaching, and providing useful resources for class work. LInC's strategies for incorporating these features are described below.

It is very important that participants have the prerequisites needed for an online course. If they don't, they will not be able to use the very mechanisms that are in place to help them during the course. To accomplish this, LInC uses an online application. This immediately screens out applicants who are unable to use a Web browser or an online form, or who don't have a working e-mail address. Because some people do not realize that they do not meet the prerequisites, the online application also contains specific questions that a person without the course prerequisites would be unable to answer. In addition, the application contains items asking if participants are able to meet specific commitments and dates for the course. This clarifies and draws attention to the key requirements for the course.

It is also important that participants know what the process of taking the course will be like. We compare taking an online course for the first time to being in a foreign country. Participants need to know the "local customs" in order to be comfortable and effective. We provide an orientation for participants to let them know the goals, process, product and resources for the course. This includes an introductory description of the class, tips for success in an online course, a scenario describing what a participant does in a typical week and a tour of the resources available to help. In particular, participants need to understand that the online chat serves the same function as a face-to-face class meeting, that they need to schedule

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regular blocks of time to work on the class and resist the temptation to procrastinate, and that they need to be active in asking questions and sharing ideas so the class can meet their needs.

Another crucial component of a course is interaction. This makes the course meaningful and reduces procrastination. In LInC, participants have frequent interaction with each other by attending weekly two-hour online chats where they discuss requested topics, collaborate on projects and present their work for feedback every few weeks. In addition, participants are asked to reflect and share ideas using the electronic discussion board or the course listserv. Participants also have frequent interaction with course facilitators. The course is team-taught, but each of the participant teams has a "primary facilitator" who is responsible for guiding that team and making sure their needs are met. Participants can ask questions or request feedback at any time by sending e-mail, posting a message on the bulletin board or attending optional weekly office hours that are offered via online chat. Facilitators check for postings many times throughout the week so participants do not have to wait a week until the next class session for a response.

Any course that is team-taught requires facilitator communication. In a face-to-face course, this may happen at lunch, on breaks or as participants are arriving for class. These meetings do not happen as automatically in an online course, so they need to be scheduled. In addition, LInC has developed several other strategies for facilitator communication. Firstly, LInC facilitators meet in the same physical location for key online chats. If they are not in the same physical location, they communicate with each other on a special channel *during* online chats for class. This is extremely useful because it allows facilitators to support each other in answering questions, moderating discussions and coordinating times to switch to the next breakout topic. Secondly, LInC facilitators send a copy of all e-mail communication to a staff listserv. This allows all facilitators to understand the progress of all participants. This is especially useful for office hours because any participant may come and ask questions of whichever facilitator is offering office hours. This also avoids duplication of work because one facilitator can incorporate an answer from another facilitator if a similar question arises. Lastly, mentors provide extensive support to new online facilitators. They do this by attending the new facilitators' online chats and answering questions from the new facilitator during the chat using the special channel for facilitators. They also answer questions from new facilitators outside of the chat via e-mail and phone and help new facilitators plan their courses.

Finally, effective resources and information dissemination are very important for an online class. Communication and resources need to be more complete and varied in an online course where participants do not see or hear instructors each week. To compensate for this, class information needs to be communicated in multiple ways and take multiple learning styles into account. For example, orientation information for LInC is discussed in an online chat, posted on Web pages, mailed to participants in hard copy and communicated in an introductory phone call. Extensive online materials are available at all times to participants so they can proceed at their own pace and direct their own learning. These online materials include guiding questions, examples, descriptions, templates, rubrics, tutorials and resource links. Media used include text, graphics and animation clips with and without audio. Participants can use their preferred navigation aids to find needed materials. Aids include a navigation bar, topic home pages with annotated lists of resources, a table of contents, resources listed by assignment and a search function.

Leadership Development Strategies

LInC employs a variety of strategies to develop leaders who can assist others in effectively using technology for engaged learning. These include administrative, follow-up and other strategies.

We require participants to come as school/district leadership teams rather than individually because teams are more effective at catalyzing change in a district. In order to ensure that participants come with administrative support, the program is discussed with administrators and they must submit a letter for their team indicating how support will be provided in each of the key areas needed for successful participation. In addition, we ask participants to contact and involve key people in their district when they plan and roll-out their staff development in order to get input and ensure "buy in."

LInC also provides follow-up support which is an essential component to ensure that the learning is implemented back in the classroom. Follow-up activities include a listserv and face-to-face or online meetings to learn about the latest innovations in technology and education. During these meetings, attendees share concerns, ideas and information about topics they have requested such as grant writing, staff development, project implementation, problem-based learning and cutting-edge software.

In order to sustain change and so that dissemination is not left to chance, many other facets of the program give support such as peer review and coaching, an embedded leadership component, online materials for participants and facilitators that can be used as building blocks to create and tailor local staff development, an academy to develop facilitator skills and extensive mentoring for new facilitators.

Conclusions and Future Work

LInC is an effective program and is continuing to expand to better serve a larger audience. An external evaluator concluded that LInC is an "effective model for Internet use, classroom instruction and teacher training." LInC has developed and refined a wide variety of scaffolding strategies to assist educators in making the transition from traditional lecture-based teaching to technology-supported engaged learning. LInC has also created a successful full-online course by developing online strategies to maintain and improve upon essential qualities of the original face-to-face course. The online format has allowed more educators from under-served urban and rural areas to participate. Another strength of the LInC program is the development of teams of educators who provide leadership in their districts in the form of staff development, technology committee participation and grant writing.

Currently, we do not have enough capacity to offer the course to all educators who have requested it. We are seeking partners to develop "centers" which offer LInC Online on a regular basis in order to provide the professional development needed to create more educational leaders who use technology to improve teaching and learning.

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